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SBE Certified Senior
Broadcast Engineer

NARTE First Class
Certified Engineer
December 26, 1993

Mr. William F. Caton, Secretary
Federal Communications Commission
Washington, D.C. 20554

Reference: MM Docket 93-177

Dear Mr. Secretary,

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Transmitted herein are one original plus four (4) copies of my reply
comments to MM Docket 93-177 (RM-7594).

Questions regarding this filing may be directed to the undersigned.

Sincerely,



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Before the
FEDERAL COMMUNICATIONS COMMISSION
Washington, D.C.

In The Matter of
MM Docket MM 93-177
Reply Comments to Notice of Inquiry
December, 1993

Before the
FEDERAL COMMUNICATIONS COMMISSION
Washington, D.C.

RECEIVED**DEC 29 1993**

In The Matter of

An Inquiry Into the Commission's
Policies and Rules Regarding AM
Radio Service Directional Antenna
Performance Verification

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)
) MM Docket 93-177
) RM-7594
)

Reply Comments of Thomas Gary Osenkowsky

This writer has examined the comments submitted by all parties reference MM Docket 93-177 pertaining to a review of the Commission's Rules on AM Directional Antennas. The majority of commenters recognize the difficulties often encountered when performing and analyzing field intensity measurements used to prove directional array performance. The initial petition filed with the Commission suggests there are alternative means such as numerical computer techniques which can obviate often ambiguous field measurement results.

The comments submitted by this writer encourage the Commission to adopt a policy allowing the use of numerical "Moment Method" computer techniques in the proof-of-performance stage of a directional array. It is believed the radiation pattern produced by the use of this technique will resemble the design pattern with a greater degree of accuracy than often misleading horizontal plane field intensity measurements. This writer also proposed that the Commission adopt a mathematical standard by which such computer analysis would be conducted.

Most commenters who support the use of computer analysis agree, with the exception of Suffa & Cavell, Inc. who cite possible future availability of more accurate models, that the Commission must adopt a **standard** method of analysis. My initial comments proposed the use of NEC3-GS which is not currently available to the public. Subsequent communication with two of the writers of MININEC (J.C. Rockway and James Logan) suggest the NEC4 code as an appropriate numerical code, however, NEC4 is likewise unavailable in the public domain due to military restrictions. Discussions with the Army are presently underway to secure the release of NEC4. NEC4 has the ability to accurately model imperfect grounds which are more appropriate for vertical monopole radiator analysis. In fact, two commenters (National Association of Broadcasters, Appendix A and Cohen & Dippell citation 8) specifically point out the relevance of interelement ground dielectric/conductivity as a factor in array performance.

Most commenters, including this writer, support the deletion of the Commission's requirement for base ammeters. Nearly all commenters cite the need for a well designed and maintained sample system. Such a system provides a correlated set of operating parameters to theoretical complex field ratios specified in the station license, obviating the need for base ratio maintenance. This information is valuable in both the initial tuneup stage as well as long term operating parameter maintenance since the monitored magnitude/phase indications bear a mathematically coherent relationship to the design theoretical parameters as determined by the Moment Method.

Some commenters propose modification of the Rules regarding field intensity measurements. T.Z. Sawyer Technical Consultants (TZSC) suggest deletion of routine monitor point measurements in exchange for yearly skeleton proofs and prefer a DA to ND ratio analysis to the last full proof. The majority of DA stations, especially older ones, do not have pushbutton ND operation available. The cost of installing the necessary RF relays, detuning networks, AC control lines, etc would be prohibitive. Independent Broadcast Consultants, Inc. (IBC) contends "Unlike theoretical models, antenna proof measurements reflect real world conditions and take into account the impact of natural and man-made objects..". IBC further states "Lacking measurement data at (these) vertical angles ... one must assume that a properly tuned horizontal pattern generates its standard pattern equivalent off the horizon." Capital Cities/ABC, Inc. similarly comments "only on-site measurements can take account of the complex, real world variations... that can dramatically alter the predicted directional antenna performance."

Most commenters strongly agree that field intensity measurements reflect real world influences. Field intensity measurement analysis may produce results that are ambiguous at best. Many measuring points utilized in the last full proof of performance (which may be in excess of thirty years old) are no longer accessible. The effect of local reradiators can often times result in array misadjustment due to compensation for local field distortion which may obscure the calculated IDF. The NOI seeks a viable, accurate means of ensuring proper array adjustment especially in the vertical plane.

It is common practice to "throw out" measuring points that do not meet expectations. Furthermore, techniques such as proximity correction and statistical variations can further dilute analyzed results if not applied properly. Moffet, Larson, and Johnson, Inc. (MLJ) comment appropriately regarding the use of these "creative measurement analysis techniques... would allow virtually any set of measurements to show that an array is in adjustment."

This writer believes that a **standard**, consistent internal method should be adopted by the Commission for establishing directional antenna performance. Most commenters agree, however, MLJ proposes the Rules to define "...the commercially available computer programs..". This writer believes that if a computer algorithm is adopted by the Commission, it should be in the public domain as is RADIAT. Radiotechniques Engineering Corp. correctly points out the availability of several different Moment Method codes and the fact that they are optimized for different purposes.

Stringent regulation should be placed on the design and construction of sampling systems as they will serve as continual assurance of proper array performance. Base ammeter requirements should be deleted as should the submission of direct method impedance data. The latter should be only kept on file at the station for the carrier frequency only. These sentiments are reflected by several commenters. Deletion of filed base/common point resistance data would significantly reduce the Commission's 302-BZ application processing.

Several commenters favor the deletion of "critical" status applied to some directional antenna arrays. This writer submitted as part of his comments a paper presented to the IEEE/BTS Symposium demonstrating the relationship between complex base, loop and field ratios. Moment Method analysis shows that a given amount of radiator parameter variation does not proportionally correlate to the same amount of variation at another location on that radiator, or to the field generated by that radiator. Accordingly, this method of analysis can be used to more appropriately derive permissible amounts of parameter deviation (i.e. when theoretical pattern exceeds standard pattern) at the location on the radiator where current or voltage sample is taken. Likewise, such analysis might prove the need for "critical" status to be superfluous.

Many commenters point out to the Commission that some directional arrays have fallen to disrepair and neglect. Potomac Instruments, inc. (PI) suggests that the Commission revisit the issue of technical competence of personnel charged with the operation of complex antenna systems. MLJ has made reference to "qualified engineer" in their comments. This writer recognizes the limited number of engineers experienced in the proper maintenance of directional arrays. Likewise, the licensees of multitower DA's are usually the ones financially insolvent many times due to the poor or nonexistent signal coverage to the primary market area which has changed drastically since the array was constructed. The issue of technical competence was decided by the Commission some years ago and should not be part of this NOI-NPRM process.

The Commission is urged to move forward with the NPRM stage of this inquiry. The broadcast industry would benefit from Rules which reflect new technologies. The benefit would result in lower costs for broadcasters and a reduction in interference due to precise adjustment of directional antenna systems. Practitioners experienced with the use of Moment Method code recognize additional benefits such as the ability to adjust system phasing for optimum pattern bandwidth resulting in better audio performance and reduction in adjacent channel interference.

This writer supports a rapid progress to the NPRM stage of this inquiry. The Association of Federal Communications Consulting Engineers (AFCCE) proposes an industry panel to study the issues raised in the NOI. While the issues raised in the NOI are many, there appears to be a great deal of agreement among those who support the adoption of newer computational techniques, many of whom are AFCCE members and have filed comments in this matter. Sufficient papers have been presented to national and international audiences demonstrating the effectiveness and accuracy of Moment Method radiator modelling. Most, if not all, of these presentations are available in trade journals or conference Proceedings.

The Commission is encouraged to move forward in examining all possible methods of improving the AM Broadcast Service. This writer believes that the industry would respond favorably in formulating a Moment Method code specifically for AM Broadcast vertical radiators if the use of such a code were adopted by the Commission.